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Via Electronic and First-Class Mail

May 7, 2015

Ms. Shari Lynn Kolak
Remedial Project Manager
Superfund Division
U.S. Environmental Protection Agency, Region V
77 West Jackson Boulevard, SRF-5J
Chicago, IL 60604-3590

Re: Responses to Comments
Operable Unit 2 Remedial Investigation and Feasibility Study Work Plan
Lake Calumet Cluster Site, Chicago, Illinois

Dear Ms. Kolak:

This attached document provides responses to comments from the U.S. Environmental Protection Agency (USEPA) on the Remedial Investigation and Feasibility Study (RI/FS) Work Plan for Operable Unit 2 (OU2) of the Lake Calumet Cluster Site. The USEPA comments were provided via letter dated February 11, 2015 and discussed with USEPA and Illinois Environmental Protection Agency (IEPA) representatives in conference calls on March 26 and April 16, 2015. ARCADIS U.S., Inc. (ARCADIS) is revising the OU2 RI/FS Work Plan in accordance with these responses for resubmittal to USEPA. We trust these responses are consistent with our discussions and the Statement of Work appended to the 2013 Administrative Settlement Agreement and Order on Consent. We look forward to resolving any remaining issues and, after finalizing the planning documents, moving forward with the RI. If you have questions regarding this submittal or related project matters, please do not hesitate to contact me.

Respectfully submitted,

Leo M. Brausch
Project Coordinator

LMB:

Attachment

cc: P. Lake, IEPA (2 copies)

cc (via email):
S. M. Franzetti, Esq.
J. Kratzmeyer, ARCADIS
P. Lake, IEPA
LCCS Technical Committee

Responses to U.S. Environmental Protection Agency Comments
Remedial Investigation/Feasibility Study Work Plan
Operable Unit 2
Lake Calumet Cluster Site, Chicago, Illinois

This document provides responses to comments from the U.S. Environmental Protection Agency (USEPA) on the Remedial Investigation and Feasibility Study (RI/FS) Work Plan for Operable Unit 2 (OU2) of the Lake Calumet Cluster Site (LCCS or the "Site").[1] The USEPA comments were provided via letter dated February 11, 2015 and discussed with USEPA and Illinois Environmental Protection Agency (IEPA) representatives in conference calls on March 26 and April 16, 2015. On behalf of the Respondents to the Administrative Settlement Agreement and Order on Consent, ARCADIS U.S., Inc. (ARCADIS) is revising the OU2 RI/FS Work Plan consistent with these responses for resubmittal to USEPA.

The individual comments are shown below followed by the Group's response in *italicized* type.[2]

1. General Comment - The RI/FS Work Plan for OU2 should be organized in a manner that demonstrates the RI requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (the NCP, 40 CFR 300.430(d)(1) and (d)(2)) will be met. NCP requirements such as the classification of surface water and groundwater, characterization of the waste (concentration, toxicity, propensity to bioaccumulate, persistence and mobility), the extent to which sources can be identified and characterized, and, identification of actual and potential exposure pathways and routes all need to be investigation goals in the document. Only by having these goals and clearly presenting the extent to which historic data address these goals in the text, can the adequacy be demonstrated of the proposed "data gap" sampling in meeting these NCP mandates.

This general comment is addressed through clarifications and changes to the OU2 RI/FS Work Plan in response to other general and specific comments. The OU2 RI/FS Work Plan is specifically designed to provide the data needed to characterize the nature and extent of contamination in groundwater entering the Site, at the Site, and emanating from the Site, consistent with the Statement of Work (SOW) appended to the 2013 Administrative Settlement Agreement and Order on Consent.

2. General Comment - The OU2 Work Plan discusses the U.S. Army Corp of Engineers (USACE) Indian Ridge Marsh restoration project but does not discuss the data in terms of the Superfund RI requirements. A new section should be added to the OU2 Work

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[1] ARCADIS U.S., Inc., 2012. *RI/FS Work Plan, Operable Unit Two, Lake Calumet Cluster Site, Chicago, Illinois.* Prepared for the Lake Calumet Cluster Site Group. December 17.

[2] In the listed comments, call-outs for acronyms have been modified as needed to provide consistency throughout this document.

Plan that discusses Indian Ridge Marsh in terms of the Superfund RI process. This section should focus on evaluating the existing, usable data in terms of the RI requirements for characterizing the full nature and extent of contamination in Indian Ridge Marsh. This section should also discuss data gaps, how these gaps will be addressed in the OU2 Work Plan, and a sampling strategy for Indian Ridge Marsh. Please revise OU2 Work Plan accordingly.

ARCADIS is conducting a Level IV validation of the 2009 sediment and surface water sampling data collected by the USACE from Indian Ridge Marsh and will provide a summary of the results of the data validation in the OU2 RI/FS Work Plan. ARCADIS will also review the results of toxicity testing (bioassays) performed on sediment samples collected by the USACE from Indian Ridge Marsh and provide a summary in the OU2 RI/FS Work Plan. The results of the toxicity analyses are presented in the "2009 Ecotoxicological Evaluation of Indian Ridge Marsh in Chicago, Illinois" (Tetra Tech EM, Inc. [Tetra Tech], 2009). Preliminary review of the results indicates that the sediment toxicity tests were performed using recognized and accepted analytical protocols and in a manner consistent with standard practices.

Based on the scope of the LCCS OU2 RI as defined in SOW and considering the multiple sources that have historically affected the marsh, impacts to Indian Ridge Marsh come into play for the OU2 RI and risk assessments only to the extent that groundwater currently emanating from the LCCS is affecting the marsh. Beyond this limitation, there is no need to further characterize the marsh or try to evaluate historical impacts as part of this RI.

3. General Comment - A preliminary conceptual site model (CSM) should be included in the OU2 Work Plan to ensure all receptors and exposure points are addressed before the Baseline Human Health Risk Assessment (BHHRA) is conducted. The CSM should describe potential migration and exposure pathways and a preliminary assessment of human health and environmental impacts. The proposed assumptions which will be used to calculate risk for various exposure scenarios described in the CSM should also be provided.

The OU2 RI/FS Work Plan will be revised to include a preliminary CSM that identifies potential exposure pathways and receptors related to Site groundwater.

4. Section 1.0, Introduction, first paragraph, page 1 - Specify that the RI/FS work is being done under the 2013 Administrative Settlement Agreement and Order on Consent (Settlement Agreement).

Section 1.0 of the Work Plan will be revised as requested.

5. Section 1.0, Introduction, second paragraph, page 1 - USACE sampling data/reports are not listed under paragraph 21 of the RI/FS Settlement Agreement. Reports listed under this section have been reviewed by USEPA and determined to meet, among other things, USEPA Quality Assurance/Quality Control (QA/QC) criteria. Based upon a review of the USACE surface water and sediment data (collected by Tetra Tech in 2009), USEPA has determined the USACE data does not meet Superfund QA/QC

criteria and therefore, the data cannot be used in the BHHRA or ecological risk assessments. Reference to USACE data as "being obtained in accordance with standard data QA/QC criteria accepted by EPA" should be removed from the OU2 Work Plan.

See response to General Comment 2.

Also, the Group does not believe that omission from paragraph 21 of the Settlement Agreement is determinative. The Settlement Agreement enumerates three specific documents that were determined to have been obtained in accordance with USEPA QA/QC methods, but there is no indication the list is exclusive. When evaluated in context of other available documents, the list is clearly not exclusive. The Settlement Agreement does not mention the Ecology and Environment, Inc. (E&E) report from 2007 that was prepared for IEPA, six years before the Settlement Agreement. To conclude that a report must be enumerated in paragraph 21 to be considered acceptable would lead to the perplexing conclusion that the E&E (2007) report would be unusable while the E&E (1999), which was also prepared for IEPA, was approved.

The Tetra Tech 2008 and 2009 ecotoxicological evaluations of soil, sediment and surface water, and groundwater sampling results at Indian Ridge March are identified in Section 1.1.1 of the SOW as sources of data relevant to the OU2 RI/FS. These data are useful in scoping the OU2 RI as indicated in the Work Plan. The reference to USACE data being obtained in accordance with standard data QA/QC criteria accepted by USEPA will be revisited following completion of data validation as described in the response to General Comment 2.

6. Section 1.0, Introduction, second paragraph, page 1 - The purpose of the OU2 RI is to characterize the nature and extent of contamination in groundwater entering the Site, at the Site, and emanating from the Site and not just "to characterize groundwater impacts." This should be clearly stated in the Work Plan. The OU2 Work Plan should make it clear that the FS will evaluate remedial alternatives for groundwater at and emanating from the Site and not just "evaluate groundwater remedial alternatives, if necessary." It is not clear why a "focused" list of groundwater remedial alternatives will be evaluated.

The OU2 RI/FS Work Plan was written before the SOW, so some inconsistencies in wording need to be addressed in the Work Plan. Section 1.0 of the Work Plan will be revised to clarify that, consistent with the SOW, the OU2 RI is designed to characterize the nature and extent of contamination in groundwater entering the Site, at the Site, and emanating from the Site. The scope of the OU2 RI relative to groundwater conditions in the interior of the Site is discussed further in the response to Comment 20.

The FS will evaluate remedial alternatives for groundwater at and emanating from the Site to the extent remediation is required to meet remedial action objectives. Consistent with the SOW, the OU2 FS "will be focused on the requirements for remedial action to address groundwater contamination at and emanating from the Site."

7. Section 1.0, Introduction, third paragraph, page 1 - Surface water and sediment investigations in Indian Ridge Marsh are not being proposed in the OU2 Work Plan.

Instead ARCADIS is proposing that the need for additional investigations in Indian Ridge Marsh will be determined as a step in the ecological risk assessment process. This is not acceptable. As noted in comment #5 above, USACE data does not meet USEPA QA/QC criteria and cannot be used for purposes of Superfund RI site or risk characterization purposes. In addition, previous sediment and surface water sampling in Indian Ridge Marsh was limited. Additional sampling to characterize the full nature and extent of contamination emanating from the Site that has come to be located in Indian Ridge Marsh is warranted.

Over many years, Indian Ridge Marsh has been affected by multiple sources of constituents of potential concern (COPCs)[3] located throughout the region that were transported to the marsh by multiple pathways. In addition, Indian Ridge Marsh was used for the disposal of slag from steel-making operations and dredged materials from the Calumet Harbor and River during the 1970s. Large portions of the marsh were filled with dredged material from disposal activities of the USACE.

In the context of Indian Ridge Marsh, OU2 at the LCCS is specifically focused on the potential for COPC transport into the Marsh via groundwater that is emanating from the Site. The surface water and sediment sampling needed to achieve that goal, if any, is expected to be very limited. OU2 is not intended to assess COPC transport from the LCCS to Indian Ridge Marsh via surface water (which was addressed by OU1), much less assess the many outside sources of COPCs that may be found in surface waters or sediment in the Marsh. To suggest that the OU2 RI needs to include sampling to characterize the full nature and extent of contamination emanating from the Site is inconsistent with the scope of the OU2 RI as defined in the SOW.

Moreover, work done by the USACE at Indian Ridge Marsh has included surface water, sediment, and vegetation sampling as well as toxicity testing. These data provide insight into COPCs in the Marsh and their potential effects. Pending validation, those data are usable, as discussed further in the response to General Comment 2

Finally, in the April 16, 2015 conference call discussion, the USEPA ecological risk assessor agreed that the scoping of any further investigations needed for Indian Ridge Marsh would most logically be completed after COPCs are identified in the screening process. The OU2 RI/FS Work Plan will be revised to reflect this agreement and state that the need for further assessment of conditions in Indian Ridge Marsh will be evaluated after completion of the groundwater characterization activities described in the Work Plan.

8. Section 2.2.5, Local Hydrogeology, page 6 - Second sentence, change to read "Some of the groundwater appears to discharge to the Indian Ridge Marsh to the east under certain flow conditions."

[3] When referring specifically to potential ecological impacts, the term constituent of potential ecological concern (COPEC) is also used.

Section 2.2.5 of the RI/FS will be revised in response to this request. The degree to which shallow groundwater discharges to Indian Ridge Marsh will be investigated in the RI.

9. Section 2.4, Operable Unit One, page 9 - Due to the very shallow groundwater present at LCCS (approximately 3 feet below the ground surface [ft-bgs]), the vast majority of waste material is submerged below the water table. Therefore, evaluation of direct contact exposures should not be limited to Operable Unit 1 (OU1) as implied in this section. Ingestion, inhalation, and dermal exposures by potential receptors, *e.g.*, construction workers and industrial site workers, to contaminants in groundwater located in the upper 10 ft-bgs needs to be addressed as part of the OU2 risk assessment.

The OU2 RI will summarize the results of the previously completed BHHRA with respect to potential exposure to on-site groundwater.[4] That BHHRA showed estimated cancer risks from exposure to groundwater via direct contact pathways were less than 10^{-6} and estimated hazard indices for non-cancer risks were less than 1.0. Moreover, OU1 provides for capping the LCCS and for long-term institutional controls for the Site. Exposure by workers to impacted groundwater within the confines of the LCCS is addressed by OU1, including but not limited to worker health and safety protection programs associated with OU1 implementation.

10. Section 2.5, Prior Groundwater Investigations, pages 10-11 - The work plan identifies four groundwater investigations (1998, 1999, 2002, and 2007) that have been conducted at LCCS by IEPA and USEPA contractor E&E. Table 1 indicates that the P01 to P05 wells were installed in October 1990 on the Alburn property. E&E installed these wells also and the text should be revised to reflect this. The depth of the waste materials has been determined in limited areas of the site (primarily at the Alburn and U.S. Drum parcels at the northern end of LCCS). Only a handful of borings/wells were advanced within the 38-acre Unnamed Parcel and no borings/wells were placed within the Paxton Lagoons area. No historic E&E boring logs and monitoring well construction diagrams were found in the OU2 Work Plan. All available historic boring logs and well diagrams should be included as an attachment to the RI/FS Work Plan. In addition, cross-sectional diagrams depicting the type of fill/waste and native soils encountered in historic borings in the LCCS should be presented in the OU2 Work Plan.

In response to this request, available boring logs and monitoring well construction diagrams will be appended to the OU2 RI/FS Work Plan.[5] Generalized cross-sections depicting the type of fill/waste and native soils encountered in historic borings in the LCCS will not be included

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[4] Montgomery Watson Harza, 2002, *Human Health Risk Assessment (HHRA) Report for the LCC site: Alburn, U.S. Drum II, and Unnamed Parcel Areas – Final Report*, prepared for the City of Chicago, Department of Environment. February.

[5] In accordance with Section 1.1.1 of the SOW, the Group requests that USEPA and IEPA make available pertinent information, including boring logs and well construction diagrams for wells present on the Paxton I and Paxton II sites and IEPA well abandonment logs for those monitoring wells within the footprint of IEPA's placed grading layer at the LCCS.

in the Work Plan but will be presented in the RI after the thickness of the placed fill at the Site (i.e., the OU1 grading layer) can be determined.

11. Section 2.6, Summary of Groundwater Impacts, page 11 - The first paragraph of this section states that 2002 and 2007 groundwater monitoring data were compared to "IEPA Class II Groundwater Remediation Objectives" from Illinois' Tiered Approach for Corrective Action Objectives (TACO, 35 IAC 742). The absence of potential groundwater use as a residential potable water supply is offered as the rationale for why the "Tier II" objectives are appropriate. There are several problems with this determination and with using TACO as the sole source of groundwater remediation objectives (GROs):

    a. Because it is not an enforceable regulation, TACO is not an Applicable or Relevant and Appropriate Requirement (ARAR) as defined in CERCLA and NCP. It contains To Be Considered (TBC) criteria. Illinois' groundwater ARARs are found in 35 IAC Part 620 and these standards have been incorporated into TACO. However, the TACO regulation includes GROs for some chemical compounds not found in 35 IAC 620. Therefore, in the absence of 620 groundwater quality standards (chemical-specific ARARs) for a particular compound, the TACO GROs (or TBCs) should be used for screening site data. The non-620 TACO GROs were derived using the same procedures found in 35 IAC 620, Subpart F, Health Advisories. Potentially then, the non-620 TACO GROs could be considered ARARs through this 35 IAC 620 derivation.

    b. Classification of groundwater in Illinois under 35 IAC Part 620, Subpart B, is not defined by the current use of that groundwater. Rather, it is the hydrogeologic properties of the aquifer itself which are to be used to determine whether the groundwater is capable of potable use now or sometime in the future. Illinois Class I, Potable Resource Groundwater, is defined in 35 IAC 620.210(a) and 620.210(b). The Class I Groundwater Quality Standards may be found at 35 IAC 620.410.

    Among the aquifer characteristics that trigger a Class I designation are the presence of unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and contains 12% or less fines; and, hydraulic conductivity of 1×10^{-4} centimeter per second (cm/sec) or greater. Illinois Class II, General Resource Groundwater, is a default groundwater classification and is defined in 35 IAC 620.220 as groundwater that doesn't meet the definition of Class I, III, or IV groundwaters.

    c. Despite the claim in this section that a Class II groundwater designation is appropriate for LCCS, no attempt at classifying the groundwater has been made as required by Illinois groundwater ARARs. The Dolton sand unit has been identified in thicknesses greater than 5 feet very close to the site and appears to thicken going toward the east according ISWS. E&E's 1999 boring logs

confirm that a vertically significant gray sand layer is or layers are present in unfilled areas at or near the eastern boundary of LCCS (LC-02 - 4.5 feet thick (depth 3.5 to 8 ft-bgs); LC-04 - 3 feet to the bottom of boring (depth 13 to 16 ft-bgs); and LC-11 - 6 feet (depth 13 to 19 ft-bgs).

The Dolton sand unit immediately adjacent to LCCS and the remnants remaining after 40 plus years of filling activities on-site quite possibly have Class I groundwater characteristics ($K > 1 \times 10^{-4}$ cm/sec) that need to be evaluated as part of the OU2 Work Plan.

d. USEPA, through the NCP, has an expectation "to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, USEPA expects to prevent further migration of the plume, prevent exposure the contaminated groundwater and evaluate further risk reduction" (40 CFR 300.430(a)(ii)(F)).

The Group recognizes that classification of groundwater in Illinois under 35 IAC Part 620, Subpart B, is defined the hydrogeologic properties of the aquifer and whether the groundwater is capable of being used as a potable water supply now or in the future. The OU2 RI/FS Work Plan will identify that an RI objective is to evaluate hydrogeologic conditions needed to define the classification of site groundwater. The Work Plan will also clarify that the FS will identify ARARs, describe how the ARAR could be applied at the site, and discuss site conditions that may give rise to an ARAR waiver.

The data tables in the Work Plan will be revised to show comparisons to both the Class 1 and Class 2 Part 620 standards and revise any language or figures that imply it has already been determined that Class 2 Part 620 standards are applicable (and not add any language suggesting Class 1 are the appropriate standards). References to the Illinois' Tiered Approach for Corrective Action Objectives (TACO, 35 IAC 742) will be removed, except for those constituents for which there is a TACO standard but no Part 620 standard.

The Group appreciates the CERCLA expectations with respect to groundwater restoration. The RI/FS, including the human health and ecological risk assessments, will be developed to address those expectations under the specific circumstances of this Site.

12. Section 2.6, Summary of Groundwater Impacts, page 11 - The LCCS Group will need to classify the groundwater within, below, and immediately adjacent to LCCS in accordance with Illinois groundwater ARARs. It should be noted that any impacted Class II groundwater (*e.g.*, groundwater within the upper 10 ft-bgs) that is in hydraulic communication with a Class I aquifer must be addressed in a manner that will protect the Class I aquifer.

See response to Comment 11. Also, to clarify the proposed process for classification of groundwater, the Group will revise the OU2 RI/FS Work Plan to state that groundwater in native water-bearing units at the Site will be compared to Class I (Part 620) groundwater

quality standards, or, for compounds that do not have a Class I standard in Part 620, to TACO Tier 1 Remediation Objectives for groundwater ingestion for Class I groundwater. These comparisons may be adjusted in the future if investigative results (e.g., slug test data) indicate that groundwater does not meet the definition of Class I groundwater.

As discussed with representatives of USEPA and IEPA during the March 26, 2015 call, water within fill or waste materials will not be characterized or classified as part of the RI. Water in reworked or disturbed soil material within the fill/waste unit, such as a saturated sand layer vertically located between two apparent fill layers, will be treated similarly to water within fill/waste.

13. Section 2.6, Summary of Groundwater Impacts, page 11 - For purposes of the OU2 RI and evaluating groundwater impacts, all historical groundwater data (1999, 2001, and 2007) should be compared to applicable federal and state groundwater standards including USEPA Maximum Contaminant Levels (MCLs), Tapwater Regional Screening Levels (RSLs), and Illinois Groundwater Quality Standards under 35 IAC Part 620. The OU2 Work Plan should include text/tables showing these comparisons.

The Group believes that, as discussed in the responses to Comments 11 and 12, the Illinois Groundwater Quality Standards under 35 IAC Part 620 are the appropriate screening levels for the RI/FS Work Plan. Given the circumstances of this Site, groundwater consumption as a potable water supply is not an operative exposure pathway, and MCLs and Tapwater RSLs are not relevant or appropriate screening criteria. In the RI, groundwater discharge to surface water in Indian Ridge Marsh will be compared to the benchmarks discussed in Comment 17.

14. Section 2.6, Summary of Groundwater Impacts, pages 11-13 - As an indication of the Class I groundwater COPCs, listed below is an evaluation of E&E's 1999 groundwater sampling summary results found in Appendix B, Tables D-11 and D-12. The 1999 tables in Appendix B do not specify well locations. Thus, it is not known whether these results include samples from the off-site wells located on the Paxton I or Paxton II sites. The constituents for which maximum results exceeded Illinois EPA's Class I groundwater quality standards are included in the table:

Section 620.410: Groundwater Quality Standards for Class I: Potable Resource Groundwater[6]

Constituent	Standard (mg/L)	Maximum Concentration (mg/L)
Antimony	0.006	0.160
Arsenic	0.010	0.122
Barium	2.0	4.650

[6] Table reformatted for clarity.

Constituent	Standard (mg/L)	Maximum Concentration (mg/L)
Beryllium	0.004	0.006
Boron	2.0	NR*
Cadmium	0.005	0.148
Chromium	0.1	0.352
Copper	0.65	1.17
Iron	5.0	1,370
Lead	0.0075	3.11
Manganese	0.15	12.7
Mercury	0.002	0.009
Nickel	0.1	1.86
Thallium	0.002	0.016
Vanadium	0.049	0.254
Zinc	5.0	47.9
Benzene	0.005	2.4
Benzo(a)anthracene	0.00013	0.008
Benzo(b)fluoranthene	0.00018	0.010
Benzo(k)fluoranthene	0.00017	0.009
Benzo(a)pyrene	0.0002	0.008
Dibenzo(a,h)anthracene	0.0003	0.001
Dichloromethane	0.005	22.0
Di(2-ethylhexyl)phthalate	0.006	0.079
Indeno(1,2,3-cd)pyrene	0.00043	0.002
1,1-Dichloroethylene	0.007	0.750
2-Methylnaphthalene	0.028	0.07
2-Methylphenol	0.35	0.37
Monochlorobenzene	0.1	0.17
Naphthalene	0.14	0.420
Phenols	0.1	3.30
Tetrachloroethylene	0.005	0.13
Toluene	1.0	38.0
Trichloroethylene	0.005	0.27
Vinyl Chloride	0.002	0.084
Xylenes	10.0	18.0

* NR – No result found in Appendix B, Table D-11

The OU2 RI will characterize current conditions in groundwater through mass flux mapping and installation and sampling of permanent monitoring wells, as discussed in the response to Comments 39 and 40.

15. Section 2.7.1, Site Setting and Description, page 13 - Please update the status of the USACE IRM Restoration Project as it is unclear if any of the planned work (*i.e.*, vegetative berm, trail system improvement, *etc.*) has been completed.

From discussions with the USACE Project Manager, the Group understands that the USACE will complete its construction at Indian Ridge Marsh in the spring 2015, and the project will be closed out in the fall of 2015. This work has involved vegetative habitat improvement, aquatic habitat improvements, hydraulic controls, and improved public access.

Specifically, invasive plant species were removed using herbicides and prescribed burning, and new plants were planted to improve a variety of habitats and provide stabilization and decrease sediment runoff for the upland areas. Leaf compost was also incorporated into select upland areas. The leaf compost increases the organic carbon in the soils to facilitate binding of metals, pesticides, and polycyclic aromatic hydrocarbons (PAHs). To improve surface water quality, all common carp were removed. Hydraulic control measures included cleaning the culvert under 122nd Street and installing a water control structure south of 122nd Street within the ditch that connects with the Calumet River. Finally, USACE removed 500 tons of debris including approximately 1,000 tires, improved the trail system, and constructed a boardwalk to link the Indian Ridge Marsh trail system to the Sidestream Elevated Pool Aeration station along the Calumet River..

16. Section 2.7.1, Site Setting and Description, page 14 - Please add "to meet the goals of the ecological restoration project" so the sentence reads "Based on the results of sampling conducted by the USACE in Indian Ridge Marsh, it was determined that removal of sediments was not necessary to meet the goals of the ecological restoration project." The need for remedial action and/or no remedial action in Indian Ridge Marsh will be determined as part of the Superfund RI/FS process and not from the USACE studies as implied in the text. Please revise the OU2 Work Plan accordingly.

The RI/FS Work Plan will be revised to make the requested change. See also response to Comments 2, 5, and 7.

17. Section 2.7.2, Indian Ridge Marsh Data, page 14 - For purposes of the OU2 RI, maximum concentrations of site related groundwater contaminants should be compared with other relevant surface water and sediment ecotoxicity benchmark values and methodologies, including but not limited to those provided by the U.S. EPA Region 5 Ecological Screening Levels (R5 ESLs), Great Lakes Water Quality Initiative methodologies, and Illinois Derived Water Quality Standards. Due to the screening level nature of part of the assessment, the most conservative value obtained from the set of applicable and relevant ecotoxicity sources, should be selected as the benchmark for each contaminant being assessed in the SLERA.

The RI/FS Work Plan will be revised to indicate that COPC concentrations in groundwater emanating from the Site (i.e., groundwater samples representative of groundwater that is venting to surface water at Indian Ridge Marsh) will conservatively be compared to appropriate surface water benchmark values and methodologies. Comparisons within the BHHRA will be to human health criteria listed in the Illinois Derived Water Quality Standards. Comparisons in the ecological risk assessment will be to Calumet Open Space Reserve (COSR) benchmark values developed under the Calumet Area Toxicology Protocol (CATP). For those constituents without a COSR surface water benchmark, benchmarks provided by the USEPA Region 5 Ecological Screening Levels and Great Lakes Water Quality Initiative methodologies, will be used.

18. Section 2.7.2.2, Surface Water Data, pages 15-16 - The Conclusions and Recommendations in Section 4.0 of the 2009 Ecotoxicological Evaluation Addendum stated "The surface water results identified a potential issue of concern due to the elevated ammonia concentrations. The ammonia levels found in all but two of the surface water samples were well above the Illinois Water Quality acute criteria for un-ionized ammonia, indicating a potential impact to the aquatic community at IRM." The Addendum also states "Previous reports have identified the Cluster Site as the source for the ammonia. Ammonia groundwater concentrations immediately west of the site have been reported as high as 100 mg/L." The Ecotoxicological Evaluation – Addendum then recommends "It would be important to determine whether ammonia levels at IRM vary seasonally, and whether actions at the [Cluster] site could improve current ammonia levels." The recommendations from the 2009 Ecotoxicological Evaluation for additional sampling and analysis, should be implemented.

The OU2 RI is designed to determine the nature and extent of the release or threatened releases of COPCs, including ammonia, to Indian Ridge Marsh. Seasonal fluctuation of ammonia will be identified in the RI through quarterly groundwater monitoring (see response to Comment 42). If ammonia emanating from the LCCS is identified as a concern as a result of the RI and risk assessments, the FS will evaluate appropriate response actions.

19. Section 2.7.2.2, Surface Water Data, pages 15-16 - It needs to be established if there are current surface water contaminant releases from LCCS. Since ammonia is commonly associated with landfill/open dump leachate, the IRM surface water and groundwater seeps should also be sampled for the complete target Compound List (TCL) of potential contaminants including Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), Polychlorinated Biphenyls (PCBs), pesticides, and [Target Analyte List {TAL}] metals. The 2008 Ecotoxicological Evaluation and the 2009 Addendum only sampled the surface water for metals and ammonia. Seasonal variations need to be taken into consideration while designing sampling plans for the IRM seeps and surface water.

The RI/FS Work Plan will be revised to include an inspection of the LCCS boundary for seeps, especially along the eastern side near the Norfolk-Southern railroad right-of-way. If seeps are present, they will be sampled for TCL organics, target analyte list TAL inorganics, and

ammonia. Surface water runoff and associated sediment transport from the Site were addressed in OU1 and are outside the scope of OU2.

20. Section 2.8, Groundwater Data Gaps, page 16 - In addition to the data gaps listed, characterization of LCCS groundwater contaminant source areas and waste materials within each parcel; characterizing the nature and extent of groundwater contamination on-Site and emanating from the Site; and classification of the aquifer within which the LCCS waste materials are situated pursuant to 35 IAC 620 are all data gaps that need to be added to the OU2 Work Plan.

See responses to Comments 11 and 12.

The Group recognizes the importance of understanding source area conditions in order to assess the need and alternatives for remedial action, if any. The LCCS is comprised of 60+ acres of potential "sources" where the great majority of the waste resides in the saturated zone and has been in direct contact with groundwater for many decades. The likelihood of finding groundwater impacts that can be tied to a localized hot spot is very small, and even if such an investigation were to be conducted, that investigation would only be initiated as a result of what was discovered in the groundwater investigation. As a result, the Group believes that characterizing the cumulative contributions of these heterogeneous source areas to groundwater impacts, through assessment of groundwater quality at the downgradient property, is the most appropriate initial strategy for determining the need for further characterization of source areas. If elevated COPC concentrations are found in the groundwater venting to Indian Ridge Marsh or otherwise migrating off-site, a focused investigation as to the source of those COPCs may be conducted, if practicable, to assess how or if that source could be abated.

21. Section 3.0, Site Characterization Tasks, page 17 - Evaluating the nature and extent of off-site groundwater contaminant releases needs to be added as one of the principal objectives of site characterization. The OU2 Work Plan should also state that site characterization tasks described in this section will be performed in accordance with the USEPA-approved Field Sampling Plan and Quality Assurance Project Plan.

See response to Comment 12. The RI/FS Work Plan will be revised to clarify that the Site characterization tasks will be conducted in accordance with the USEPA-approved Field Sampling Plan and Quality Assurance Project Plan.

22. Section 3.2, Phase I – Piezometer Installation, page 18 - Due to the variable nature of observed groundwater flow and assumed heterogeneity of fill materials at LCCS, the number and location of the proposed piezometers are not adequate.

    a. Currently the four proposed piezometers are positioned roughly at the corners of the rectangle encompassing the Alburn, US Drum, and Unnamed Parcels. The distance between the northern and southern piezometers is roughly 1,600 feet. The distance between the eastern and western piezometers is roughly 1,000 feet. In order to get more representative potentiometric data, a total of 16

perimeter piezometers should be placed along the LCCS site boundary such that wells are located at each of the four corners with three wells placed between each corner in all four compass directions.

b. Two interior piezometers are being proposed to be placed along the centerline of the Alburn/US Drum/Unnamed parcel sub area (which excludes Paxton Lagoons). The number of interior piezometers in the OU2 Work Plan should be increased to four; such that two of the interior piezometers will be aligned along each of the diagonals of the outer LCCS boundary rectangle.

c. Since one of the primary objectives of the Work Plan is to determine what contaminants are coming onto and leaving LCCS, the OU2 Work Plan should include a representative number of off-site piezometers in all four compass directions. Placement of the off-site piezometers should identify the vertical and horizontal groundwater gradients associated with the distinct geologic strata believed to be present adjacent to LCCS.

To address concerns over the site hydrogeological conditions, the scope of work presented in the RI/FS Work Plan will be revised to increase the number of piezometers to be installed in the first phase of the Site hydrogeologic investigations from 6 to 20. This expanded scope of work increases the lateral piezometer distribution across the Site and allows for data collection related to vertical gradients. The revised layout includes the following:

- *Five shallow downgradient piezometers along the eastern edge of the Site to increase resolution along the Site boundary with Indian Ridge Marsh;*
- *Four shallow upgradient piezometers along the western property boundary;*
- *Six deep piezometers (clustered with shallow piezometers) to provide information on vertical gradients and deeper hydrostratigraphic units; and*
- *Five piezometers in the west central portion of the Site.*

The planned piezometer layout is shown in Figure 7 of the revised RI/FS Work Plan (copy of figure attached). As discussed in the conference call on April 16, 2015, the final positioning of the piezometers will need to be determined in the field.

The shallow piezometers will be installed at the water table (up to 20 ft-bgs) with a 10 foot screen. They will be set in the fill. The deep piezometers will be set in the first sand unit encountered below the fill. The estimated screened interval is 35 to 45 ft-bgs.

Additional water level measurements will be collected to characterize flow directions and variability. These activities will include monthly water level gauging or installation of transducers and data loggers at selected piezometers. Precipitation events and amounts will be tracked over the gauging period.

Existing off-Site monitoring wells will be added to the gauging program as appropriate. Most of the existing off-Site wells are completed in the fill (15 to 20 feet deep) and would be suitable for gauging if deemed necessary. Any wells that are used will be surveyed and added to Site maps, as discussed in the response to Comment 27.

23. Section 3.2, Phase 1 –Piezometer Installation, page 18 - The City of Chicago's Calumet Area Hydrologic Master Plan Volume V noted that there was much seasonal variation in groundwater elevations. The groundwater elevation varied over 3.5 feet over a one year time frame. The report described the groundwater elevations as seasonally influenced. During the winter and spring months, the groundwater elevation was above the elevation of IRM. However, during the summer months the groundwater elevation dropped below the elevation of IRM. Other evidence of seasonal variation is the presence or absence of Ammonia which sometimes was identified as a significant contaminant in the monitoring wells at the Site as noted in the 2009 Ecotoxicological Evaluation.

    The OU2 RI will need to quantify the amount of seasonal variation in groundwater potentially affecting LCCS waste materials. The OU2 RI will need to determine how seasonal variation in groundwater elevations and surface water elevations affect groundwater gradients, seep occurrence, and contaminant migration within and from LCCS.

See response to Comment 22. Quantifying the seasonal variability in groundwater will also be addressed by gauging conducted following the installation of monitoring wells (Phase 3).

24. Section 3.2.1, Piezometer Installation, page 18 - At each piezometer location, a soil core will be collected from ground surface to a depth of approximately 20 feet. Soil cores will be logged to characterize the lithology and determine the depth of the water table. The depth of the borings advanced for the piezometers should be extended to 5 feet below the bottom of waste/fill encountered or 30 ft-bgs, whichever is greater. In this way, the vertical extent of waste and the extent of vertical contaminant migration, if any, will be identified in these locations.

Continuous soil cores will be collected to the full depth of piezometer installation. For the five deeper piezometers, these cores will allow description and characterization of any distinct deeper stratigraphic units observed.

25. Section 3.2.1, Piezometer Installation, pages 18-19 - If all piezometers are not screened within the first saturated sand unit, an analysis of the potential effects of the mixture of units may have on groundwater flow directions is needed. Maps of groundwater elevation flow need to indicate when there are a mixture of wells screened in different units.

ARCADIS will provide a description of the hydrostratigraphic unit(s) monitored and an evaluation of the effects on groundwater flow when the potentiometric surface map(s) are submitted.

26. Section 3.2.1, Piezometer Installation, pages 18-19 - The work plan calls for the piezometer well screens to intersect the water table. In order to provide a good understanding of vertical groundwater gradients at LCCS, nested piezometers are needed. A second piezometer should be screened within the Dolton sand at several locations where it is present and within areas of distinct waste/fill on site. These deeper piezometers should be paired with water table piezometers. In addition, it is recommended that at several well nest locations a third piezometer be fully screened in the first native, low permeability layer encountered below the Dolton sand or waste/fill. Moreover, a sand unit was evidenced between 40 and 50 ft-bgs in well G22D (northwest corner of Alburn) and G26D (on Paxton I). Installation of piezometers targeting these more transmissive deeper sand units is recommended. The work plan calls for nested permanent monitoring wells as part of the final phase of the RI. However, obtaining this information prior to expending the effort and expense of installing the permanent wells and to help direct the Phase 2 HPT/VAP sampling seems to be a prudent thing to do.

See response to Comment 22.

27. Section 3.2.2, Data Collection and Evaluation, page 19 - Off-site monitoring wells or piezometers may be required for determining groundwater flow direction. It is unclear if any monitoring wells or piezometers installed as a part of the Paxton Landfills or Land & Lakes Landfill will be used to determine groundwater flow directions. Any off-site wells used to determine groundwater elevations should be included in the LCCS site survey to determine monitoring well's elevation, northings, and eastings.

See response to Comment 22. Also, the RI/FS Work Plan will be revised to clarify that the horizontal coordinates and elevations will be determined by field survey for any off-site wells used for water-level measurement or chemical sampling.

28. Section 3.2.2, Data Collection and Evaluation, pages 19-20 - The proposed piezometers are to be gauged a minimum of two times, with at least one week between gauging events to allow the potentiometric surface and groundwater flow direction to be evaluated. The OU2 Work Plan should indicate that the initial piezometer sampling results and the resultant proposed Phase 2 HPT/VAP locations will be reviewed by the regulatory agencies for their input prior to starting Phase 2 field work.

    The historic variability of groundwater flow at LCCS, at least in part, may be related to seasonal precipitation/infiltration differences. Therefore after the initial proposed gauging events which will be used to help direct HPT/VAP sampling, the Agencies recommend that the piezometers remain in the ground and that they be gauged fairly frequently over an extended period of time. It is suggested that monthly gauging be performed over the course of a year. The relationship between these gauging results and local precipitation data should be evaluated in the RI report.

See response to Comment 22. Also, as discussed in the April 16, 2015 conference call, the Group will review the results of the piezometer installation and gauging with USEPA and IEPA

before finalizing the locations of HPT/VAP borings as the second phase of the Site hydrogeologic investigations. The Group recommends that this coordination be conducted in one or more live meetings to minimize delays.

29. Section 3.3.1.1, HPT Soundings, page 21 - The HPT borings are to be advanced to approximately 50 ft-bgs. This likely will account for the deeper sand units observed in wells G22D and G26D. However, evidence has not been provided indicating that the underlying bedrock is unimpacted and/or will not be impacted by existing contamination from LCCS. No data has been provided indicating an aquitard exists between the uppermost aquifer and the bedrock. Therefore, the underlying bedrock is a potential migration route for LCCS contamination that cannot be ruled out. A small subset of HPT and Marco Core borings (4 or 5 at representatively spaced locations) should extend down to the competent bedrock surface. Installation of at least three permanent wells screened on top of bedrock should be included in the OU2 Work Plan.

While the data that ARCADIS has reviewed to date suggest that significant impacts would not be expected deeper than about 50 ft-bgs, HPT/VAP borings will be extended deeper if necessary to assess the entire vertical extent of COPC. In addition, the RI/FS Work Plan will be revised to provide for advancing up to four HPT/VAP borings to refusal, which should be at or just above bedrock. The evaluation of whether one or more deep wells are required will be determined by the data developed in the HPT/VAP work.

30. Section 3.3.1.1, HPT Soundings, page 21 and Figure 7 - The preliminary layout of the HPT borings is presented on Figure 7. Coverage provided on the eastern boundary of LCCS is sufficient (11 on-site and 1 north on Paxton I). Given the concerns regarding contamination from off-site sources, the variability of groundwater flow and the types of waste materials disposed of at LCCS, additional HPT borings are warranted. Additional perimeter HPT locations are indicated along the west end of the south boundary line (4), along the western boundary line (5), and along the northern boundary line (4). Adding these perimeter HPT locations will bring the total to eight for each of the north, south and west outer boundary lines.

    HPT data is proposed to be collected from only 4 HPT locations interior to the overall site. Three of the proposed interior HPT locations are located along the eastern border of the Paxton Lagoons parcel and the fourth interior HPT location is at the Alburn/US Drum border. All known former waste disposal areas should be targeted and representative aerial coverage is indicated. Around 12 well-spaced interior HPTs should provide reasonable aerial coverage.

The investigation approach is adaptive and additional points can be added as necessary to fill data gaps that become evident during real-time data evaluation. In the absence of data indicating significant groundwater impacts emanating from the LCCS, however, interior groundwater sampling or hydrogeologic characterization or groundwater sampling is not necessary. The need for interior characterization will be evaluated based on initial data collection as described in the response to Comment 20.

31. Section 3.3.1.2, Soil Core Collection, page 21 - The target rate of advancing Geoprobe Macro Core or Dual Tube soil borings at 30% of the HPT locations seems to be low considering the complex geology and variety of fill materials believed to be present. A target of 60% or higher is more appropriate based on site conditions. Consideration should be given to collecting soil core samples for fixed laboratory analysis within former waste disposal areas during this phase of the investigation. The need for re-mobilization to characterize source areas will be diminished if these samples are collected as part of this proposed work.

The 30-percent soil boring rate is the initial target and, as stated in the Work Plan, the total number of borings will be based on field conditions and may be increased depending on the variability in the HPT responses and the fill/soil lithologies observed. For OU2, groundwater is the only transport medium of interest, so source characterization will be inferred through the results of groundwater sampling and analysis. Sampling of solid media (e.g., waste, soil) is not included in the work scope.

32. Section 3.3.1.3, Hydraulic Testing, page 22 - Hydraulic conductivity (K) testing will be completed at select intervals using a Geoprobe pneumatic slug test kit. It is assumed that this will be done in the Macro Core drill strings, but the text should be revised to make this clear.

    The K data collected using these techniques are considered semi-quantitative and should provide good information for permanent well screen placement. However, the groundwater classification required by 35 IAC 620 must be based upon standard pump or slug testing done in permanent wells, not that generated by the HPT investigation. Pump testing in permanent wells is the preferred method for obtaining K values because it reveals the K for larger areas within the formation being tested than do slug tests.

The Work Plan will be revised to clarify that the "temporary well" used for hydraulic testing will consist of the drill string and screen-point sampling device that is used to collect the groundwater samples.

Slug tests at permanent wells will be conducted to support groundwater classification. The pneumatic slug tests using direct-push tooling will support interpretation of the HPT data and placement of permanent monitoring well screens.

33. Section 3.3.2, Vertical Aquifer Profiling (VAP), page 22 - The OU2 Work Plan is not clear whether each discreet sand unit that is separated by a clay unit will be sampled. Sand units may be thinner than five feet, but be significant contaminant flow paths. Spacing the samples every five to ten feet may likely miss these units. In addition, if a sand unit/fill unit is thicker than five feet, the OU2 Work Plan should provide the rational that will be used to locate the one foot screen sample to best target possible contaminants. If thicker units will have more than one VAP sample taken, then the OU2 Work Plan should state this.

High-permeability zones will be sampled if they represent potential transport pathways as indicated by the HPT response. The estimated vertical interval in the work plan is 5 to 10 feet with an estimated 5 samples per boring. These values are for planning purposes and to provide an indication of data density. The sample depths will be adjusted based on the HPT response to adequately characterize the permeable flow zones.

34. Section 3.3.2, Vertical Aquifer Profiling (VAP), page 22 - The VAP sampling will be done by driving a screen point sampler down to permeable zones identified through the HPT work. These grab groundwater samples are suitable for screening purposes only and will not yield definitive data that can be used for risk assessment or for direct chemical- specific ARAR comparisons. The OU2 Work Plan should be revised to provide the anticipated number VAP locations along with decision-logic that will be used to select those locations. As with the HPTs and piezometers, VAP sampling also should target permeable zones found within the LCCS source areas and in any permeable zones identified beneath the waste/fill down to bedrock through the HPT evaluation requested in comment 29 above.

The Group concurs that the VAP sampling data are for screening and characterization (Level II or Level III) and do not provide Level IV data suitable for estimations of risks in the human health or ecological risk assessments. The data collected from the VAP samples will be used in determining permanent monitoring well placement. The sampling data from these wells will be used in risk assessment and for comparisons to chemical-specific ARARs. See also response to Comments 29 and 33.

35. Section 3.3.2, Vertical Aquifer Profiling (VAP), page 23 - The VAP groundwater samples are to be analyzed only for VOCs, dissolved metals and ammonia. Although relatively higher turbidity is expected in the VAP samples, the MCLs and Illinois EPA's 620 standards assume no filtration has occurred. Based upon Class I groundwater COPCs (see comment #14), VAP groundwater samples should also be analyzed for SVOCs and total metals. Please add this to OU2 Work Plan.

All VAP groundwater samples will be analyzed for TCL VOCs and total ammonia. Because they are not collected from developed monitoring wells, however, VAP samples can be turbid, and data on total metals may not be reliable or usable. In an effort to maximize the useful data generated in the VAP sampling, samples will be collected for both total and dissolved metals analyses, and field turbidity measurements will be collected to support interpretation and evaluation of metals data.

SVOC results for VAP samples would be subject to significant interferences from turbidity, and analysis of VAP samples for SVOCs is not warranted during the initial phase of the RI. The VAP sampling will focus on higher-mobility constituents in order to guide the placement of permanent monitoring wells along flow paths for groundwater emanating from the LCCS. Samples will then be collected from these permanent monitoring wells to assess the nature and extent of groundwater SVOC impacts.

36. Section 3.3.3, Data Evaluation, pages 23 and 24 - The OU2 Work Plan should provide the rationale that will be used to evaluate potential contributions from off-site groundwater sources. The OU2 Work Plan should also explain how seasonal variations in groundwater flow conditions, flow reversals and flood/high precipitation events variations in groundwater flow conditions will be evaluated.

The evaluation of off-site contributions to COPCs in groundwater will be completed using the HPT/VAP locations both upgradient and along the edges of the property (i.e., side gradient). The flow direction at the time of sampling will be known and therefore can be used to determine the position of HPT/VAP borings with respect to the Site and off-site properties. Data on COPC concentrations from upgradient sources (e.g., Land & Lakes Landfill, Paxton II Landfill) or cross-gradient sources (e.g., Paxton I Landfill) will be examined to assess whether these sources are causing or contributing to COPC concentrations observed at or downgradient of the LCCS. Further characterizing potential off-site sources (e.g., Paxton I and Paxton II Landfill) is beyond the scope of LCCS OU2.

37. Section 3.4, Phase 3 –Monitoring Well Installation, page 24 - One additional criterion that should be added as a bullet is, "Wells will be installed to determine the nature and extent of off-site contaminant migration."

The RI/FS Work Plan will be revised as requested, clarifying that wells will be installed to assess migration of COPCs in groundwater currently emanating from the LCCS.

38. Section 3.3.3, Date Evaluation, page 24 - It is unclear how the mass flux of constituents in groundwater can be determined using one round of HPT/VAP sampling measurements. Please clarify in the OU2 Work Plan.

The evaluation of the VAP and HPT data, in conjunction with slug test results and measured hydraulic gradients, will provide a representation of the mass flux across the Site for the timeframe the data are collected. The flux evaluation will guide well placement during Phase 3, which will then be used to evaluate groundwater conditions at the Site over time. The August 2010 Interstate Technology and Regulatory Council (ITRC) guidance document, "Use and Measurement of Mass Flux and Mass Discharge (http://www.itrcweb.org/GuidanceDocuments/MASSFLUX1.pdf)," provides additional detail regarding the procedures used to evaluate mass flux and its role in remedial decisions.

39. Section 3.4, Phase 3 – Monitoring Well Installation, page 24 - Phase 2 (HPT/VAP) results are to be used to direct the locations and number of permanent wells. ARCADIS anticipates that 8 to 12 well pairs or clusters will be needed to adequately "characterize" the site. As previously noted, LCCS has not had its historic source areas characterized, has variable groundwater flows, a variety of potential upgradient contaminant sources exist, and, the site appears to have a complex aquifer matrix that includes decades of filling and waste disposal. The Agencies believe that perhaps double the number of suggested well pairs (16 – 24), or more, will be needed to actually characterize the site adequately.

The actual number of wells required to characterize groundwater entering, at, or emanating from the Site will be, as indicated in the Work Plan and this comment, determined by the results of the Phase 1 and Phase 2 evaluations. At this time, based on the objectives of the OU2 RI, the estimate of 8 to 12 well pairs appears adequate, but the number and locations of wells will be adjusted as needed following the completion of Phases 1 and 2.

40. Section 3.4, Phase 3 – Monitoring Well Installation, page 24 - Two to three wells will be installed at each location to evaluate vertical stratification of the aquifer and vertical hydraulic gradients. ARCADIS plans to target "identified mass-bearing hydrostratigraphic units (HSUs)" for the placement of well screens. As previously indicated, wells will be needed to verify that contaminant migration in more conductive zones within and below the waste/fill zones are constrained vertically and horizontally. This means wells will need to be set in potential low-permeability or "aquitard" unconsolidated sediments at depth, and, potentially placed off-site to define the lateral extent of contamination. Also, permanent wells screened on top of bedrock are requested in order to evaluate if bedrock may be impacted or should not be of concern for future investigative efforts.

The HPT/VAP sampling results will guide placement of permanent monitoring wells. As discussed in the response to Comment 29, the need for deep wells or wells screened near the top of bedrock will be evaluated based on the hydrogeological data and vertical extent of COPC identified during the initial investigation and HPT/VAP work.

In consideration of the SOW objective of characterizing impacted groundwater emanating from the Site, installation of wells in low-permeability units or aquitards is not appropriate as part of the RI. Because low-permeability units do not function as potential flow paths for significant migration of impacted groundwater, characterizing groundwater quality within low-permeability units would not provide useful data for characterizing risk to receptors or patterns of off-site migration. The Group does not envision a circumstance under which a well would be installed in a lower permeability unit. Instead, delineation will be accomplished via characterizing groundwater in permeable hydrostratigraphic units.

41. Section 3.4.1, Groundwater Monitoring, page 25 and Table 2 - Given the lack of polychlorinated dibenzo-p-dioxin/dibenzofuran sampling especially in the several LCCS source areas (four soil samples from Unnamed Parcel and four soils samples from U.S. Drum) as well as detections above Region 9 Preliminary Remediation Goals (PRGs), dioxins/furans should be added to the list of parameters to be analyzed in groundwater samples.

Polychlorinated dibenzo-p-dioxins and dibenzofurans are highly insoluble compounds that are not transported in groundwater, and, despite detections of these compounds in soil, sampling of groundwater for these compounds is not needed to satisfy the objectives of the OU2 RI/FS.

42. Section 3.4.1, Groundwater Monitoring, pages 25-26 - A single groundwater monitoring event is planned with supplemental monitoring to adequately characterize

site groundwater conditions, if necessary. As discussed in comments above, the variable groundwater flow directions, potential off-site contaminant sources and potential migration issues dictate that at least quarterly groundwater monitoring is conducted for a year. This additional sampling is requested primarily to evaluate groundwater contaminant trends in relation to seasonal changes.

The RI/FS Work Plan will be revised to provide four quarters of monitoring at the installed monitoring wells and any off-site wells needed for Site groundwater characterization.

43. Section 3.4.1, Groundwater Monitoring, page 26 - Existing sediment and surface water data are limited and do not provide adequate characterization of the nature and extent of contamination in IRM. The first paragraph on top of page 26 should be removed from the OU2 Work Plan.

See response to Comment 7.

44. Section 4.1, Background, page 26 - Since a BHHRA will be performed as part of the OU2 RI/FS, the first paragraph discussing the 2009 ATSDR Public Health Assessment results is irrelevant and should be removed from this section. Please remove the phrase "To follow-up the ATSDR Pubic Health Assessment" so the second paragraph reads "As part of the Operable Unit Two RI/FS, a Baseline Human Health Risk Assessment (BHHRA) will be performed...

The Group will make the change requested in USEPA's comment.

45. Section 4.2, Approach, page 27 - Change first sentence to read "The BHHRA will be performed to assess current and future health risks to people that may be exposed to groundwater constituents at or emanating from the Site into the adjacent Indian Ridge Marsh." Ingestion, inhalation, and dermal exposures by potential on-Site receptors (*e.g.*, construction workers, utility workers, *etc.*) to contaminants in groundwater will also need to be evaluated as part of the OU2 risk assessment. Please revise the OU2 Work Plan to include these additional receptors.

The OU2 BHHRA will focus on potential current and future health risks to persons who may be exposed to groundwater constituents at or emanating from the Site into the adjacent Indian Ridge Marsh. Potential direct-contact and inhalation pathways associated with on-site groundwater were addressed under OU1 and will not be included in the OU2 BHHRA. The Work Plan will be revised to reference the results of previously completed OU1 risk assessments relative to on-site groundwater exposures via direct contact and inhalation. See also response to Comment 9.

46. Section 4.2.1.1, COPC Screening, page 28 – Reference to "Tetra Tech 2009" sediment and surface water data should be removed for reasons discussed in comment #5 above. Historic and future sediment results should be screened against the lower of U.S. EPA's RSLs, or Illinois EPA's TACO Tier 1 values for human health. Historic and future

surface water sample results should be compared to Illinois' Numeric and Derived Water Quality Standards (35 IAC 302.208 and 302.210) for the protection of human health.

See responses to Comments 5, 7, and 17. Constituent concentrations in the groundwater venting from LCCS to Indian Ridge Marsh will be compared to Illinois' Numeric and Derived Water Quality Standards (35 IAC 302.208 and 302.210) for the protection of human health.

47. Section 4.2.1.2, Exposure Point Concentrations, pages 28-29 - The OU2 Work Plan proposes that a minimum of 5 detected concentrations and at least 8 total samples be the minimum size of a data set for performing 95% upper confidence limit (UCL) calculations. It is USEPA's policy that data sets with a minimum of 10 detected concentrations provide sufficient statistical power to be allowed to have UCL calculations performed on them. The OU2 Work Plan should be revised accordingly.

The Work Plan will be revised to be consistent with this USEPA policy.

48. Section 4.2.2, Exposure Assessment, page 29 - The OU2 Work Plan proposes that only current and future recreational receptors be evaluated in the BHHRA, but other receptors, such as construction workers and park employees, could also be exposed to site-related contamination on-site and/or in IRM. The OU2 Work Plan should be revised to include these additional receptors.

Future construction workers and park employees at Indian Ridge Marsh will be evaluated as potential receptors in the BHHRA. See also responses to Comments 9 and 45.

49. Section 4.2.3, Toxicity Assessment, pages 29-30 - For those chemicals for which BHHRA toxicity values are not available from Tiers 1 (IRIS) and 2 (PPRTV), the lowest value from the Tier 3 (other) sources should be used for screening purposes. Also, for evaluating lead risks, blood lead models should include evaluations using both 5 and 10 micrograms per deciliter (µg/dl) in order to bracket the potential risks from lead exposure. Please revise the OU2 Work Plan accordingly.

The Work Plan will be revised to be consistent with this USEPA comment.

50. Section 5.1, Background, page 30 - The text should clarify that the [Baseline] Ecological Risk Assessment (BERA) will evaluate potential risks to ecological receptors at the Site and emanating from the Site into IRM. The "Calumet Area Ecotoxicology Protocol" is not EPA "regional guidance" and should not be referenced as such in text. Second bullet referencing the Ecological Risk Assessment Guidance for Superfund, change "USEPA 1997b" to "USEPA 1997."

USEPA conducted a BERA for the LCCS,[7] which was one of the bases upon which IEPA initiated the Site capping as OU1. There is no need to reproduce that effort, especially considering that IEPA has covered the LCCS with more than one million cubic yards of fill since the USEPA completed its BERA. Only constituents emanating from the site via groundwater are in the scope of OU2.

The Work Plan will be revised as needed to clarify that the CATP is not USEPA guidance. The Group believe the CATP is very relevant given it is what is being followed in the restoration of Indian Ridge Marsh. Given that those restoration activities are well underway and are expected to be completed this year, conducting the BERA in accordance with the CATP guidance is important. At a minimum, the BERA should follow both the CATP guidance as well as USEPA guidance, to the extent the two differ.

The reference to "USEPA 1997b" is correct.

51. Section 5.2, Approach to the SLERA, page 31 - Screening level ecological risk assessments (SLERA) should be conducted in accordance with EPA guidance including, but not limited to the "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (ERAGS, EPA-540-R-97-006, OSWER Directive 9285.7-25, June 1997). Conducting a SLERA in accordance with EPA groundwater guidance is not appropriate and reference to it should be removed from the OU2 Work Plan.

As discussed in the April 16, 2015 conference call, the cited technical topic issue paper[8] defines the exposure area for aquatic organisms when conducting a groundwater-focused BERA. It is helpful in that it clearly defines the groundwater transition zone, helps guide CSM development, and offers tools for screening.

52. Section 5.2.1, Step 1, paragraph 1, page 32 - In addition to the Calumet Open Space Reserve (COSR) benchmark values, maximum concentrations of site related groundwater and surface water contaminants should also be compared with other relevant surface water ecotoxicity benchmark values and methodologies, including but not limited to those provided by the U.S. EPA Region 5 Ecological Screening Levels, Great Lakes Water Quality Initiative methodologies, and Illinois General Use and Secondary Contact Water Quality Standards (35 IAC 302.208, 302.210 and 302.407-302.410) for the protection of aquatic receptors. Historic and future sediment data also should be compared to relevant ecotoxicity benchmark values and methodologies including the lowest value from the Oak Ridge National Laboratory compendium of

[7] Springer, M. D., M. L. Huston, and D. Cooke, 2001. "Final Report, Ecological Risk Assessment, Lake Calumet Cluster Sites, Chicago, Illinois." U.S. Environmental Protection Agency, Environmental Response Team Center, Office of Emergency and Remedial Response. November.

[8] U.S. Environmental Protection Agency, 2008. "Evaluating Ground-Water/Surface-Water Transition Zones in Ecological Risk Assessments," ECO Update/Ground Water Forum Issue Paper, *Publication 9285.6-17 EPA-540-R-06-072*, Office of Solid Waste and Emergency Response. July.

screening values (http://rais.ornl.gov/tools/eco_search.php). Due to the screening level nature of this part of the assessment, the most conservative value obtained from the set of applicable and relevant ecotoxicity sources, should be selected as the benchmark for each contaminant being assessed in the SLERA.

As discussed in the response to Comment 17, COPC concentrations in groundwater emanating from the Site (i.e., groundwater samples representative of groundwater that is venting to surface water at Indian Ridge Marsh) will conservatively be compared to appropriate surface water benchmark values and methodologies. Comparisons within the BHHRA will be to human health criteria listed in the Illinois Derived Water Quality Standards. Comparisons in the ecological risk assessment will be to COSR benchmarks developed under the CATP. For those constituents without a COSR surface water benchmark, benchmarks provided by the USEPA Region 5 Ecological Screening Levels and Great Lakes Water Quality Initiative methodologies, will be used.

The need for evaluation of constituent concentrations in sediments will be determined following the screening of groundwater emanating from the LCCS. If concentrations of all constituents in groundwater are less than the applicable ecological screening benchmarks, additional evaluation of the potential effect of constituents in groundwater water emanating from LCCS would not be required. Additional evaluation of sediments will be undertaken if concentrations of constituents in groundwater exceed applicable screening benchmarks.

53. Section 5.2.1, Step 1, paragraph 3, page 33 - Valuable ecological resources are not limited to those resources that if adversely affected could impair overall ecosystem function from either a biological or social perspective. They can be ecological resources that have biological, social, or economic value separate from overall ecosystem function. An obvious example is an endangered species that is adversely impacted without the overall ecosystem being impaired.

The Work Plan will be revised to clarify that endangered species are included in the definition of valuable ecological resources.

54. Section 5.2.1, Step 1, paragraph 4, page 33 - The measurement endpoint needs to be responsive to the threat being measured but does not need to be particularly "sensitive" as the term would normally be used in this context. Although a measurement endpoint can be a proxy representing the assessment endpoint, it is not limited to that role. Thus a measurement endpoint certainly can be threatened by the same exposure pathway and can experience the same mechanisms of toxicity as the assessment endpoint, but neither of those characteristics are required.

The Work Plan sentence in question will be deleted (second sentence of second-to-last paragraph on page 33.

55. Section 5.2.1, Step 1, paragraph 5, page 33 - It is not clear from the text whether the ingestion exposure route for upper trophic level wildlife will include both water and food or only one of these. Please clarify that the combined ingestion will be considered.

The Work Plan will be revised to clarify that both food and water ingestion will be evaluated as part of the upper trophic level wildlife evaluation.

56. Section 5.2.2, Step 2, page 34 - *Although truly quantitative uncertainty evaluations are generally not feasible to achieve, quantification of uncertainty levels should be attempted to the greatest extent practicable. This will maximize decision maker or risk manager understanding for the degree of confidence the SLERA findings can be afforded.*

The Work Plan will note that uncertainties will be quantified to the extent practicable.

57. Section 9.2, Progress Reports, page 37 - The OU2 Work Plan should indicate that monthly progress reports will be submitted by the 15th day of each month. The OU2 Work Plan should also 1) describe the specific work that was performed during the reporting period; 2) include paper and electronic copies of analytical laboratory data summaries for any analytical data reports received during the reporting period; and 3) describe any modifications to procedures outlined in the RI/FS Work Plan, the Field Sampling Plan, the Quality Assurance Project Plan, or Health and Safety Plan along with the justification for the modifications. Please revised OU2 text accordingly.

Section 9.2 of the RI/FS Work Plan will be revised in accordance with this comment.

58. Section 9.3, Schedule, pages 38 and 39 - Under RI Report and FS Report, add statement that the Final RI and Final FS Report is due 30 days after USEPA's notification of any deficiencies.

Section 9.3 of the RI/FS Work Plan will be revised *in accordance with this comment.*

FIGURE

City: CHI User: gmckinney
Path: I:\LCCS\MXD\Fig7_LCCS_PZLocs.mxd

LEGEND

- PROPOSED HPT LOCATION
- PROPOSED PIEZOMETER
- LAKE CALUMET CLUSTER SITE BOUNDARY

Notes:
Bing Roads Base Image Source: ArcGIS Online Services, Access date: 12/14/2012, via ArcGIS v. 10. This image is not for re-sale or distribution outside of the use of this PDF.

LAKE CALUMET CLUSTER SITE
CHICAGO, ILLINOIS

PROPOSED PIEZOMETER AND HPT LOCATIONS

ARCADIS

FIGURE 7